Kramer Electronics, Ltd.

USER MANUAL

Model:

VS-88HD

8x8 HD-SDI Matrix Switcher

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 1,000-plus different models now appear in 13 groups[1] that are clearly defined by function.

Thank you for purchasing the Kramer **VS-88HD** *8x8 HD-SDI Matrix Switcher,* which is ideal for:

- Professional broadcasting and production studios
- Presentation applications

The package includes the following items:

- The **VS-88HD** *8x8 HD-SDI Matrix Switcher*
- **RC-IR3** remote control (with manual)
- Power cord[2] and rack "ears"
- This user manual[3]

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high performance high-resolution cables[4]

1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Routers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Video Products; GROUP 12: Digital Signage; and GROUP 13: Audio

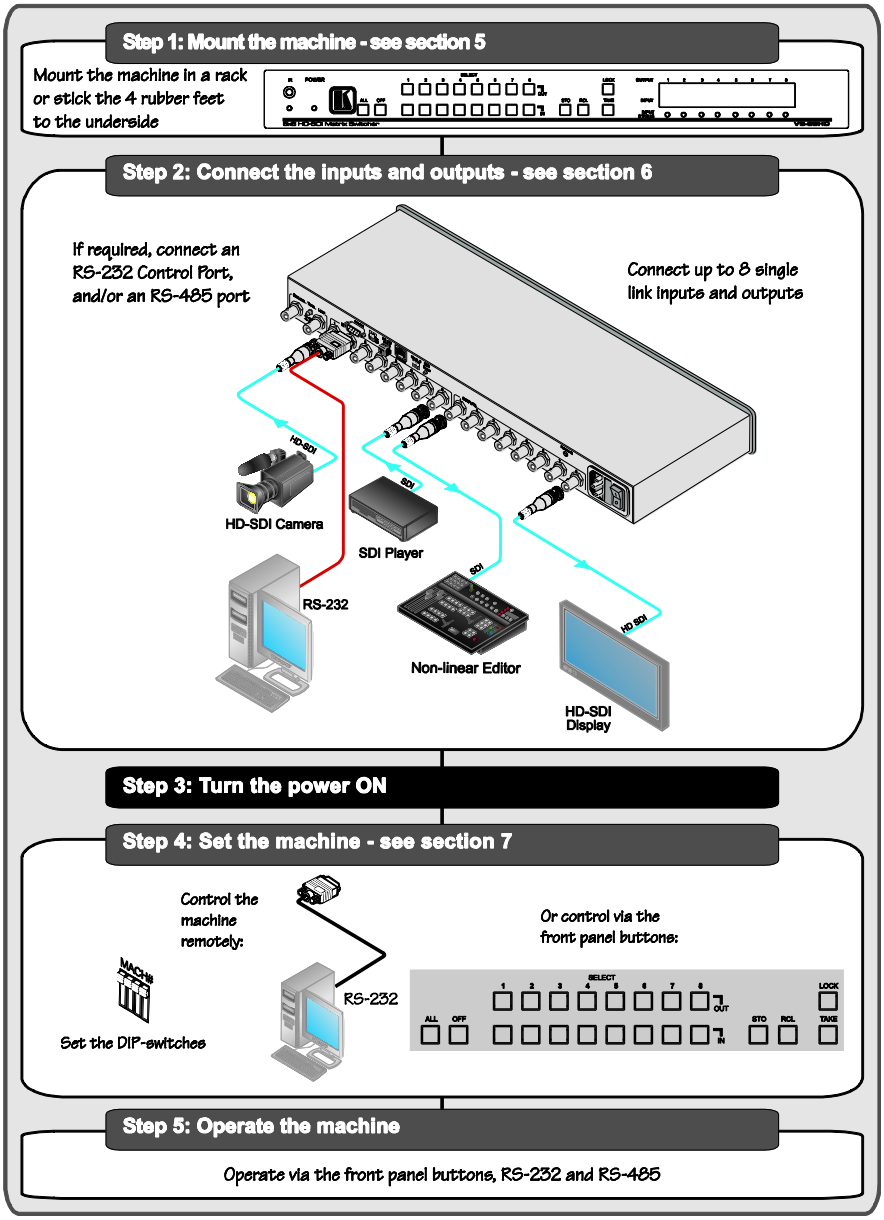
2 We recommend that you use only the power cord supplied with this device

3 Download up-to-date Kramer user manuals from our Web site at http://www.kramerelectronics.com

4 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

2.1 Quick Start

This quick start chart summarizes the basic setup and operation:


Step 1: Mount the machine - see section 5
Mount the machine in a rack or stick the 4 rubber feet to the underside
Step 2: Connect the inputs and outputs - see section 6
If required, connect an RS-232 Control Port, and/or an RS-485 port
Connect up to 8 single link inputs and outputs
HD-SDI
SDI
HD-SDI Camera
SDI Player
RS-232
Non-linear Editor
HD-SDI Display
Step 3: Turn the power ON
Step 4: Set the machine - see section 7
Control the machine remotely:
RS-232
Set the DIP-switches
Or control via the front panel buttons:
SELECT
LOCK
ALL
OFF
STO
RCL
TAKE
Step 5: Operate the machine
Operate via the front panel buttons, RS-232 and RS-485

3 Overview

The **VS-88HD** is a high-performance matrix switcher for HD-SDI and dual link HD-SDI signals. The unit can switch up to 8 single link inputs to any or all of 8 single link outputs or 4 dual link inputs to any or all of 4 dual link outputs.

In particular, the **VS-88HD** features:

- Operation of up to 1.5Gbps – enabling it to be used for standard definition and high-definition serial digital video signals (SDI/HD-SDI)
- SMPTE 259M, 344M, 292M, and 372M (dual link) compliance and support for data rates of 270Mbps, 1483.5Mbps, and 1485Mbps
- Cable equalization up to 350m for SD[1] signals and 140m for 1.5GHz HD[2] signals
- Reclocking and equalization on each input, storing and recalling setups, and a TAKE button for the execution of multiple switches all at once
- The ability to switch genlocked video signals according to the timing of the genlock reference input. Switching according to the bi-level or tri-level genlock[3] input according to SMPTE RP-168

The **VS-88HD** is housed in a 19" 1U rack-mountable enclosure, and is fed from a 100-240 VAC universal switching power supply. The unit can be controlled via the front panel buttons or via:

- An infrared remote control transmitter
- An infrared remote extension cable transmitter
- Remotely, by RS-232 or RS-485 serial commands transmitted by a PC, touch screen system, or other serial controller
- The Ethernet
- By default, the **VS-88HD** is operated using the Kramer 3000 protocol (see section 7.1.9 for details of how to switch to Protocol 2000 and section 10.2 for the relevant protocol commands)

1 Standard Definition (SD) means an NTSC or PAL compatible video format, consisting of 480 (for NTSC) or 576 (for PAL) lines of interlaced video

2 High Definition (HD) means a video format, consisting of 720 active lines of progressive video or 1080 lines of progressive or interlaced video

3 The sources must be genlocked to the GENLOCK input in order to switch clearly

To achieve the best performance:

- Use only good quality connection cables[1] to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality and position your Kramer **VS-88HD** away from moisture, excessive sunlight and dust

4 Your VS-88HD 8x8 HD-SDI Matrix Switcher

Figure 1, Table 1, and Table 2 define the **VS-88HD** *8x8 HD-SDI Matrix Switcher*.

1 Available from Kramer Electronics on our Web site at http://www.kramerelectronics.com

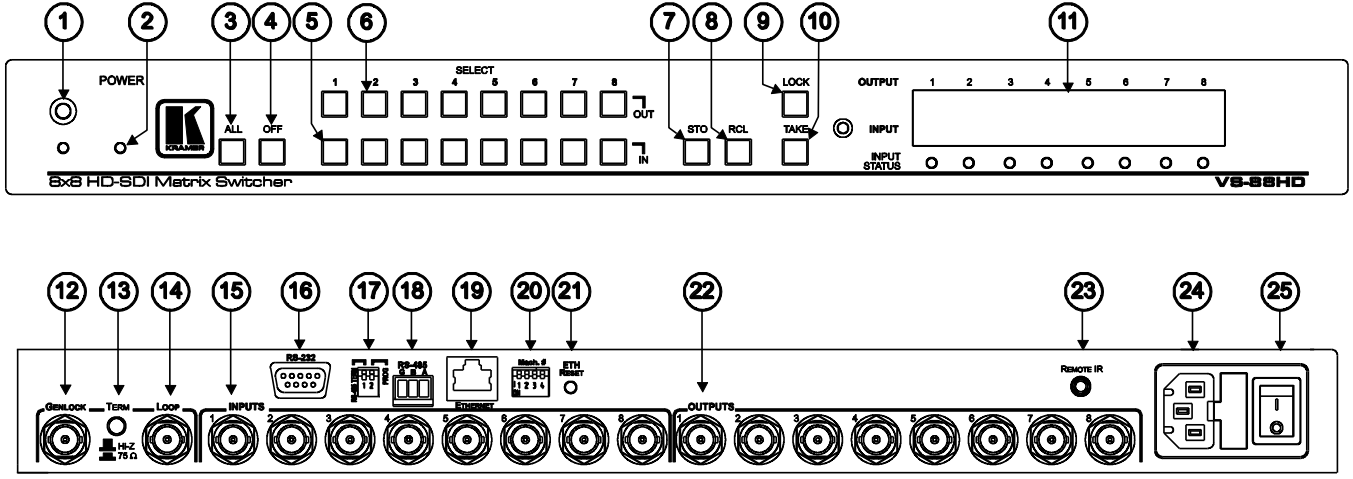


Figure 1: VS-88HD 8x8 HD-SDI Matrix Switcher

Table 1: Front Panel VS-88HD 8x8 HD-SDI Matrix Switcher

#	Feature	Function
1	IR Receiver	The yellow LED illuminates when receiving signals from the infrared remote control transmitter
2	*POWER* LED	Illuminates when the unit is ON
3	*ALL* Button	Pressing *ALL* followed by an *INPUT* button, connects that input to all outputs
4	*OFF* Button	Pressing *OFF+OUT* disconnects that output from the inputs; pressing *OFF+ALL* disconnects all the outputs; a long press toggles between dual link and normal mode (see section 6.3)
5	*IN SELECT* Buttons	Select the input to switch to the output; long presses on buttons IN1 to IN5 change the genlock timing (see Table 5)
6	*OUT SELECT* Buttons	Select the output to which the input is switched
7	*STO* (STORE) Button	Pressing STO followed by an IN / OUT button stores the current setting
8	*RCL* (*RECALL*) Button	Pressing the *RCL* button and the corresponding INPUT / OUTPUT key recalls a setup from the non-volatile memory
9	*LOCK* Button	A long press toggles activation/inactivation of the front panel buttons; pressing LOCK+OUT2 selects Protocol 2000; pressing LOCK+OUT3 selects Protocol 3000
10	*TAKE* Button	Pressing *TAKE* toggles the mode between the *CONFIRM* mode and the *AT ONCE* mode (user confirmation per action is unnecessary)
11	7-segment Display	Displays the selected input switched to the output (marked above each input)

Table 2: Rear Panel VS-88HD 8x8 HD-SDI Matrix Switcher

#	Feature	Function
12	*GENLOCK* BNC Connector	Connects to the genlock source
13	*TERM HI-Z/75Ω* Pushbutton	Press to terminate the genlock source (75Ω) or release for looping
14	*LOOP* BNC Connector	Connects to the genlock connector of the next unit in the line
15	*INPUT* BNC Connectors	Connects to the serial digital video sources
16	*RS-232* 9-pin D-sub (F) Port	Connects to the PC or the remote controller
17	*PROG/RS-485 TERM* DIP-switches	PROG DIP-switch enables microcontroller firmware upgrade RS-485 TERM DIP-switch terminates the RS-485 line with a 120Ω load
18	*RS-485* Terminal Block Port	Pins B (-) and A (+) are for RS-485; Pin G may be connected to the shield (if required)
19	*ETHERNET* RJ-45 Connector	Connects to the PC or other Serial Controller through computer networking LAN
20	*MACH #* DIP-switches	DIP-switches 1-4 for setting the Machine Address of the unit
21	*ETH RESET* Button	Press to reset to factory default definitions[1]: IP number – 192.168.1.39, Mask – 255.255.0.0, Gateway – 0.0.0.0
22	*OUTPUT* BNC Connectors	Connect to the serial digital video acceptors
23	*REMOTE IR* 3.5mm Mini Jack	Connect to an external IR receiver unit for controlling the machine via an IR remote controller (instead of using the front panel IR receiver)[2]
24	Power Connector with Fuse	AC connector enabling power supply to the unit
25	Power Switch	Turns the power to the unit ON and OFF

1 First disconnect the power cord and then connect it again while pressing the ETH Factory Reset button. The unit powers up and loads its memory with the factory default definitions and erases all stored presets

2 Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the VS-88HD (only if the internal IR connection cable has been installed) (See section 4.1)

4.1 Using the IR Transmitter

You can use the **RC-IR3** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR receiver[1]. The external IR receiver can be located 15 meters away from the machine. This distance can be extended to up to 60 meters when used with three extension cables[2].

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert the internal IR connection cable[3] with the 3.5mm connector that fits into the REMOTE IR opening on the rear panel. Connect the external IR receiver to the REMOTE IR 3.5mm connector.

1 Model: C-A35M/IRR-50

2 Model: C-A35M/A35F-50

3 P/N: 505-70434010-S

5 Installing the VS-88HD in a Rack

This section provides instructions for rack mounting the unit.

Before installing in a rack, be sure that the environment is within the recommended range:

OPERATING TEMPERATURE:	0° to +40°C (32° to 104°F)
STORAGE TEMPERATURE:	-40° to +70°C (-40° to 158°F)
HUMIDITY:	10% to 90%, RHL non-condensing

CAUTION!

When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.

2. Once rack mounted, enough air will still flow around the machine.

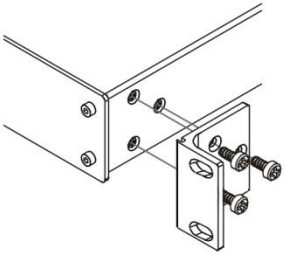
3. The machine is placed straight in the correct horizontal position.

4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.

5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (3 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note:

- In some models, the front panel may feature built-in rack ears
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions available from our Web site

6 Connecting the VS-88HD

This section describes how to connect the **VS-88HD** in single link mode (see section 6.1) and in dual link mode (see section 6.2).

6.1 Connecting the VS-88HD in the Single Link Mode

The **VS-88HD** can switch one of the eight SDI/HD-SDI inputs to any or all of the eight SDI/HD-SDI outputs, as the example in Figure 2 shows.

To connect the **VS-88HD** *8x8 HD-SDI Matrix Switcher*, do the following[1]:

1. Connect up to eight SDI sources to the SDI INPUT BNC connectors (for example, an HD/SD camera to INPUT 1 and an SDI player to INPUT 8).
2. Connect the SDI OUTPUT BNC connectors to up to eight SDI acceptors (for example, OUTPUT 1 to a non-linear editor, and OUTPUT 8 to an HD SDI display).
3. Set the DIP-switches (see section 6.4.2).
4. Optionally[2], connect:
   - A genlock source to the GENLOCK BNC connector
   - The LOOP BNC connector to the GENLOCK connector of the next unit in the line, and release the TERM button for looping[3]
5. Connect a PC and/or controller (if required), to the:
   - RS-232 port (see section 6.4), and/or
   - RS-485 port (see section 6.5), and/or
   - ETHERNET connector (see section 6.7)
6. Connect the power cord[4].

1 Switch OFF the power on each device before connecting it to your VS-88HD. After connecting your VS-88HD, switch on its power and then switch on the power on each device

2 Not illustrated in Figure 2

3 Pushed in terminates the input. Release when the input extends to another unit

4 We recommend that you use only the power cord that is supplied with this machine

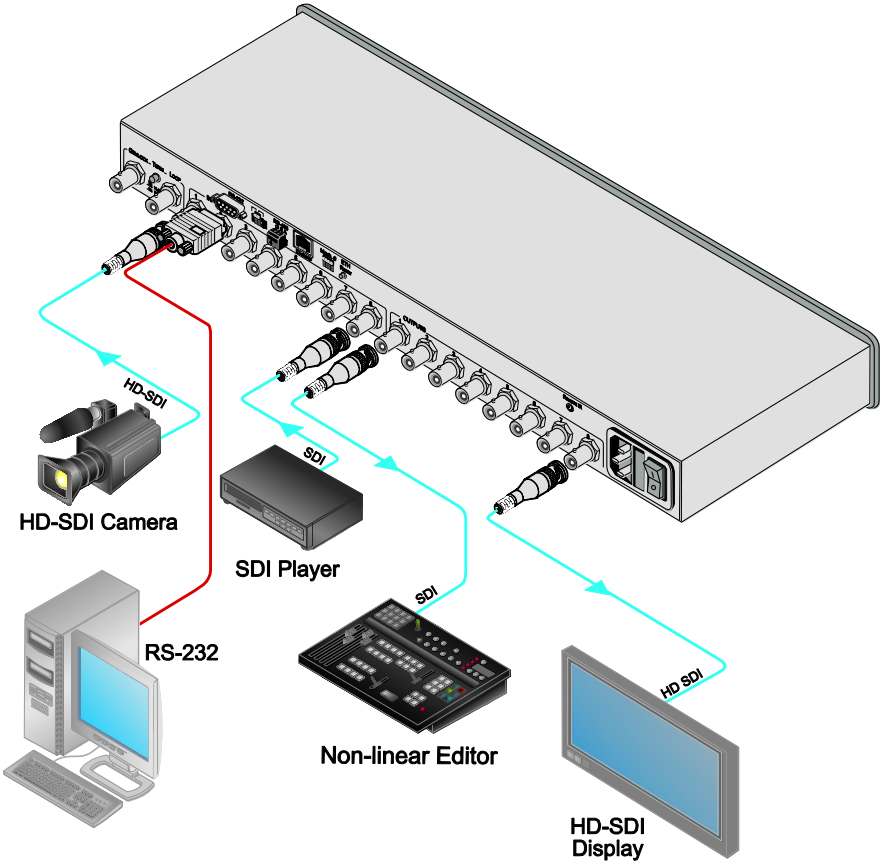


Figure 2: Connecting the VS-88HD 8x8 HD-SDI Matrix Switcher

6.2 Connecting the VS-88HD in the Dual Link Mode

You can use your **VS-88HD** in the dual-link mode to switch any of the four dual-link SDI inputs to any or all of the four dual-link SDI outputs, as the example in Figure 3 and Figure 4 shows[1].

To connect the **VS-88HD** *8x8 HD-SDI Matrix Switcher* in the dual-link mode, do the following[2]:

1. Connect up to 4 of the SDI sources to the INPUT DUAL LINK BNC connectors. For example, a dual-link HD-SDI camera to DUAL LINK 1 (inputs 1 and 2) and a dual-link HD video server to DUAL LINK 4 (inputs 7 and 8).
2. Connect the SDI OUTPUT BNC connectors to up to four SDI acceptors. For example, OUTPUT DUAL LINK 3 (outputs 5 and 6) to a dual-link preview display and OUTPUT DUAL LINK 4 (outputs 7 and 8) to a dual-link HD-SDI mixer.
3. Set the DIP-switches (see section 6.4.2).
4. Optionally[3], connect:
   - A genlock source to the GENLOCK BNC connector
   - The LOOP BNC connector to the GENLOCK connector of the next unit in the line, and release the TERM button for looping4
5. Connect a PC and/or controller (if required), to the:
   - RS-232 port (see section 6.4), and/or
   - RS-485 port (see section 6.5), and/or
   - ETHERNET connector (see section 6.7)
6. Connect the power cord[5].
7. Set the machine to the dual-link mode (see section 6.3).

Note: In dual link mode only the first input status LED lights when both inputs are connected. For example, if inputs 3 and 4 are connected as a dual link, only the input status LED 3 lights.

1 The graphic on the rear panel does not indicate the dual link connections

2 Switch OFF the power on each device before connecting it to your VS-88HD. After connecting your VS-88HD, switch on its power and then switch on the power on each device

3 Not illustrated in Figure 2

4 Pushed in terminates the input. Release when the input extends to another unit

5 We recommend that you use only the power cord that is supplied with this machine

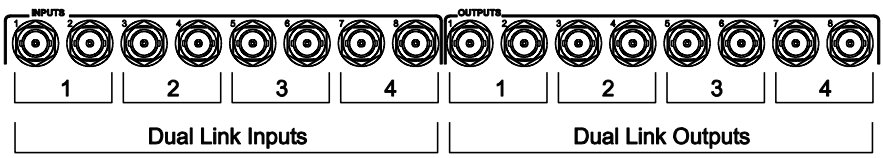


Figure 3: VS-88HD Dual-Link Inputs and Outputs

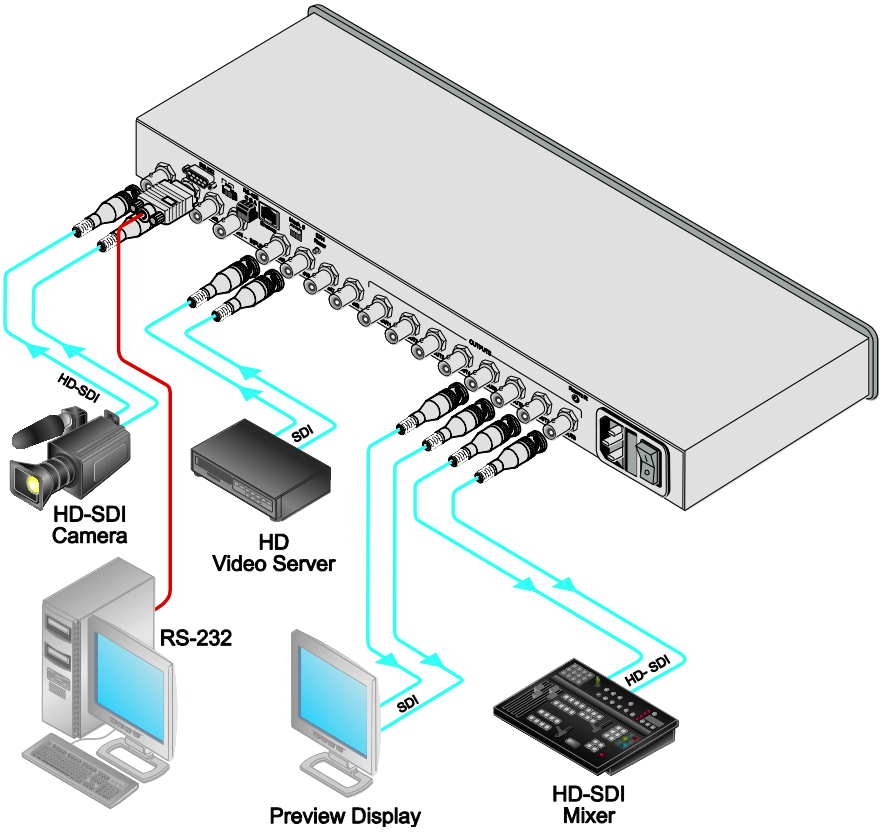


Figure 4: Connecting the Dual-Link VS-88HD 8x8 HD-SDI Matrix Switcher

6.3 Setting the Working Mode

To enter the dual-link mode:

- Press and hold the OFF front panel button for 3 seconds until the 7-segment display shows 4 dual-link devices in the first 4 outputs of the display and "dl" in the rest of the outputs

To exit the dual-link mode:

- Press and hold the OFF front panel button for 3 seconds until the 7-segment display shows devices in all the 8 outputs

Notes:

1. The unit stays in the last working mode even after being powered down or after rebooting. It only changes after you perform the above procedure.
2. The error sign $\equiv$ appears when switching to an illegal configuration. It can also appear momentarily during switching[1].

6.4 Connecting the RS-232 Port

You can connect to the **VS-88HD** via an RS-232 connection using, for example, a PC. Note that a null-modem adapter/connection is not required.

To connect to the **VS-88HD** via RS-232:

- Connect the RS-232 9-pin D-sub rear panel port on the **VS-88HD** unit via a 9-wire straight cable (only pin 2 to pin 2, pin 3 to pin 3, and pin 5 to pin 5 need to be connected) to the RS-232 9-pin D-sub port on your PC

6.4.1 Determining the Machine Number

Each unit must be identified by a unique Machine #. Determine the Machine # according to Table 3.

- When using a single unit, set the unit to Machine # 1.
- A master unit must be Machine #1.

When connecting more than one **VS-88HD** unit, set a different Machine # on each unit. The units do not have to be numbered sequentially but each unit must have a unique machine number.

1 In this case it can be ignored

Table 3: Machine # DIP-Switch Settings

Machine #	DIP-SWITCH			
	1	2	3	4
1 (Single or master unit[1])	OFF ON	OFF OFF	OFF OFF	OFF OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Note: After changing the address, the device must be reset by turning OFF and ON.

6.4.2 Setting the DIP-Switches

When controlling a unit via the RS-232 or RS-485 ports set the DIP-switches on the rear of the unit. Figure 5 and Table 4 define the DIP-switches[2]:

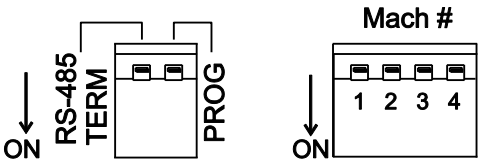


Figure 5: DIP-Switch Settings

Table 4: DIP-Switch Settings

DIPS	Function	Description
RS-485 Term	RS-485 line termination	OFF for no RS-485 line termination ON for RS-485 120Ω line termination
PROG	Firmware update	Set ON only to update device firmware
MACH # 1, 2, 3, 4	Self Address	Sets the MACHINE #

1 A single or master unit can have the address 0 or 1

2 The default address is 0 (all DIP-switches are OFF)

The RS-485 TERM DIP-switch is used only when the RS-485 port is connected (see section 6.5). The first and last units on the RS-485 line (for example, the controller and the last **VS-88HD**) must be terminated; the units in between must not be terminated.

Set the PROG DIP-switch ON only while updating the unit firmware, otherwise the switch must be OFF.

6.5 Connecting a PC or Controller to the RS-485 Port

You can operate the **VS-88HD** via the RS-485 port from a distance of up to 1200 meters (3900ft) using any device equipped with an RS-485 port (for example, a PC). For successful communication, you must set the RS-485 machine number and bus termination.

To connect a device with a RS-485 port to the **VS-88HD**:

- Connect the A (+) pin on the RS-485 port of the PC to the A (+) pin on the RS-485 port on the rear panel of the **VS-88HD**
- Connect the B (–) pin on the RS-485 port of the PC to the B (–) pin on the RS-485 port on the rear panel of the **VS-88HD**
- Connect the G pin on the RS-485 port of the PC to the G pin on the RS-485 port on the rear panel of the **VS-88HD**

6.5.1 Setting the Address Switches

To set the address DIP-switches, as shown in Figure 5:

- Assign Master Machine #1 to the master unit with the address 0 or 1 set in the DIP-switches
- Assign a unique Machine # from 2 to 15 for each **VS-88HD** slave unit using Table 3. The units do not have to be sequentially numbered but they must have unique addresses

6.5.2 Setting the Line Termination

To ensure correct operation, the RS-485 line must be terminated at both ends. The master unit may be located at any part of the line, but when it is at the end of the line, the termination switch must be set ON.

To set line termination, as shown in Figure 5:

- For the **VS-88HD** units located at the ends of the RS-485 line, set the RS-485 TERM DIP-switch ON
- For all other **VS-88HD** units in the middle of the line, set the RS-485 TERM DIP-switch OFF

6.6 Switching Genlocked Video Signals

The genlock feature lets you switch genlocked video signals according to timing of the GENLOCK reference input[1].

1. Connect the GENLOCK cable.
2. To set the genlock timing, press and hold for 3 seconds the appropriate input button as follows[2]:

Table 5: Genlock Settings

To Set	Press and Hold for 3 Seconds	Displayed
1080i/p @50Hz	IN 2	1080 50H
720p @60Hz	IN 3	720P 60H
PAL @50Hz	IN 4	PAL 50H
NTSC @60Hz	IN 5	NtSC 60H

Note: When turning the machine ON, the last stored setup is shown in the 7-segment display.

6.7 Connecting the Ethernet Port

You can connect the **VS-88HD** via the ETHERNET in the following ways:

- For direct connection to the PC, use a crossover cable (see section 6.7.1)
- For connection via a network hub or network router, use a straight-through cable (see section 6.7.2)

6.7.1 Connecting the ETHERNET Port Directly to a PC (Crossover Cable)

You can connect the Ethernet port of the **VS-88HD** to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

This type of connection is recommended for identification of the factory default IP address[3] of the **VS-88HD** during the initial configuration

After connecting the Ethernet port, configure your PC as follows:

1. Right-click the My Network Places icon on your desktop.

1 According to SMPTE RP-168. The sources must be genlocked to the GENLOCK input in order to switch cleanly

2 The unit will detect automatically when SD-SDI inputs are used

3 The default IP address is 192.168.1.39

2. Select **Properties**.
3. Right-click Local Area Connection Properties.
4. Select **Properties**.
   The Local Area Connection Properties window appears.
5. Select the Internet Protocol (TCP/IP) and click the **Properties** Button (see Figure 6).

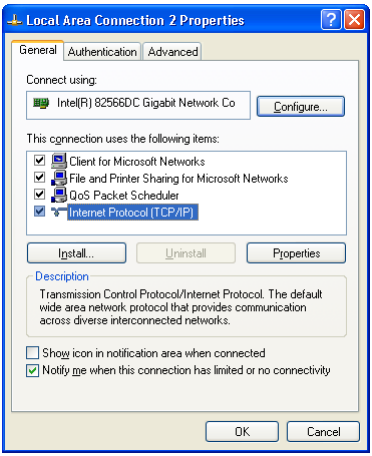


Figure 6: Local Area Connection Properties Window

6. Select Use the following IP Address, and fill in the details as shown in Figure 7.
7. Click **OK**.

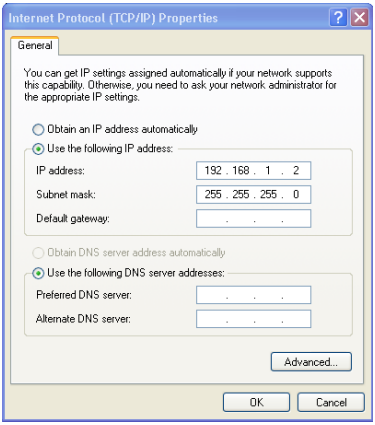

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 1 . 2
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Figure 7: Internet Protocol (TCP/IP) Properties Window

6.7.2 Connecting the ETHERNET Port via a Network Hub (Straight-Through Cable)

You can connect the Ethernet port of the **VS-88HD** to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.

6.8 Configuring the Ethernet Port

To configure the Ethernet port, download the *Device Properties* Ethernet configuration software. Extract the file to a folder and create a shortcut on your desktop to the file.

Follow these steps to configure the port:

1. Double click the desktop icon.
   The Connect screen appears as follows:

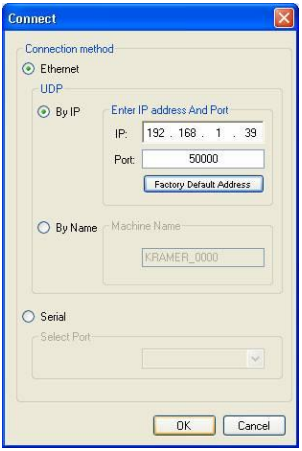


Figure 8: Connect Screen

2. Select the method to connect to the Ethernet port of the **VS-88HD**. Select:
   - Ethernet, if you know the IP address number[1] or the machine name. The default name for the machine is KRAMER_XXXX[2]
   - Serial, if you are connected via a serial port

1 The default IP address is 192.168.1.39

2 The four digits are the last four digits of the machine's serial number.

3. Click OK.
   The Device Properties window appears:

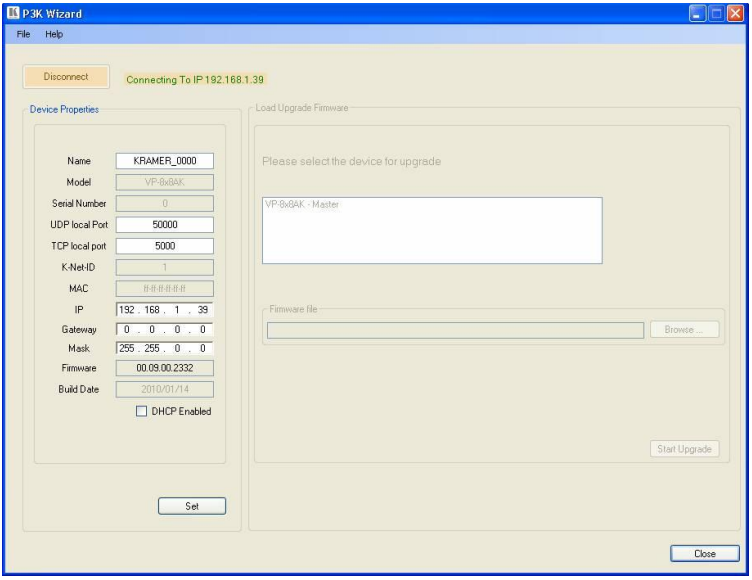


Figure 9: Device Properties Screen

4. If required, make changes and press Set. If not, click Close.

6.9 Controlling via the Ethernet Port

You can control the **VS-88HD** via RS-232/RS-485 or the Ethernet using the Kramer K-Router application.

If you are controlling a standalone unit via RS-232 or the Ethernet, configure the unit as master (Mach No. 1), see section 6.4.1.

6.10 Using the Ethernet Reset Button

To reset Ethernet parameters to the factory defaults:

1. Turn the power switch OFF and then ON while pressing the ETH RESET button.
2. The unit powers up and loads its memory with the factory default definitions.
3. The unit also erases all stored presets, returns to the default Protocol 3000 and indicates "F-rst" on the 7-segment display.

7 Operating the VS-88HD

You can operate your **VS-88HD** using:

- The front panel buttons
- RS-232/RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- The **RC-IR3** infrared remote control transmitter

7.1 Operating the VS-88HD from the Front Panel

The following operations are performed by using the front panel buttons.

7.1.1 Power On Display

When the **VS-88HD** is powered on, the display briefly shows the 4-digit firmware version number, the genlock timing setting, and then the display changes to its normal operating display.

7.1.2 Using the AT ONCE and CONFIRM Modes

Choose to work in either the AT ONCE or the CONFIRM modes. When the **VS-88HD** operates in the AT ONCE mode, pressing an OUT-IN combination implements the switch immediately. In the CONFIRM mode, the change does not take place until the TAKE button is pressed.

The AT ONCE mode is faster since execution is immediate and actions require no user confirmation. However, no protection is offered against changing an action in error.

In the CONFIRM mode:

- You can key-in several actions and then confirm them by pressing the “TAKE” button, to simultaneously activate the multiple switches
- Every action requires user confirmation, protecting against erroneous switching due to human error (pressing the wrong button)
- Execution is delayed until the user confirms the action

7.1.3 Switching in the AT ONCE Mode

To switch an input to an output in the AT ONCE mode, do the following:

1. Press an OUT SELECT button[1] or the ALL button.
   The 7-segment display flashes.
2. Press an IN SELECT button1 or the OFF button[2].
   The selected input switches to the selected output. The digits displayed in the 7-segment display change as appropriate.

7.1.4 Toggling Between Modes

To toggle between the AT ONCE and CONFIRM modes, do the following:

1. Press the TAKE button to toggle from the AT ONCE mode (in which the TAKE button is not lit) to the CONFIRM mode (in which the TAKE button illuminates).
   Actions now require user confirmation and the TAKE button illuminates.
2. Press the illuminated TAKE button to toggle from the CONFIRM mode back to the AT ONCE mode.
   TAKE button turns off and actions no longer require user confirmation.

7.1.5 Switching in the CONFIRM Mode

To switch in the CONFIRM mode, when the TAKE button is illuminated, do the following:

1. Press an OUT-IN combination.
   The 7-segment display flashes[3].
2. Press the TAKE button to confirm the action.
   The 7-segment display stops flashing. The TAKE button stays lit.

To confirm several actions (in CONFIRM mode), do the following:

1. Press each OUT-IN combination in sequence.
   The 7-segment display flashes.
2. Press the TAKE button to confirm all the actions.
   The 7-segment display stops flashing. The TAKE button stays lit.

7.1.6 Storing an Input/Output Configuration

You can store up to 16 configurations in memory and recall them as presets using the eight IN SELECT buttons and the eight OUT SELECT buttons.

To store the current configuration, do the following:

1 From 1 to 8

2 For immediate switching

3 The timeout lasts for 10 seconds

1. Press the STO button.
   The STO button flashes.
2. Press one of the IN / OUT SELECT buttons.
   The current configuration is stored in memory at the chosen preset #.

7.1.7 Recalling an Input/Output Configuration

To recall an input/output configuration, do the following:

1. Press the RCL button.
   The RCL button flashes.
2. Press the appropriate IN / OUT SELECT button (the button # corresponding to the preset #).
   The chosen preset configuration is restored from memory.

Note: Recalling an invalid setup gives an error indication.

If you cannot remember which of the eight input/output configurations is the one that you want, set the **VS-88HD** to the CONFIRM mode and manually scan all the input/output configurations until you locate it.

7.1.8 Locking the Front Panel

Lock the front panel buttons to prevent unwanted key presses from changing the existing setup.

- To lock the front panel, press and hold the LOCK key for three seconds.
  The LOCK key illuminates and the front panel keys are inactivated
- To unlock the front panel, press and hold the illuminated LOCK key until the light turns off.
  The front panel keys are activated

7.1.9 Switching Protocols

You can operate the **VS-88HD** using either the KRAMER 2000 or the default KRAMER 3000 serial protocol.

- To choose the Kramer 2000 protocol instead of the default Protocol 3000, press LOCK and OUT 2 at the same time.
  LOCK flashes briefly if the change was made correctly
- To revert to the Kramer 3000 protocol, press LOCK and OUT 3 at the same time.
  LOCK flashes briefly if the change was made correctly

7.1.10 Indicating Errors

If the front panel buttons were incorrectly pressed, such as pressing two keys at once, or an invalid setup # was chosen for recall, the following error indication occurs:

- The STO, RCL, LOCK, and TAKE buttons all flash together for one second and return to their previous state

If an error is indicated, retry the previous action or choose a new action.

7.2 Using Serial Commands

To operate the **VS-88HD** using serial commands, Kramer offers control software that can do this. You can download free software from the Kramer Electronics Web site.

- For an explanation of all KRAMER 3000 commands, see section 10.2
- For an explanation of all KRAMER 2000 commands, see section 12

7.3 Using the Infrared Remote Controller

To operate the **VS-88HD** using the **RC-IR3** infrared remote controller, see the User Manual packed with the remote controller[1].

Note:

- The remote control cannot set single or dual mode operation or change genlock timing. They can only be set from the front panel
- The IR remote can only set 8 preset configurations equivalent to OUT1 to OUT8

1 See also the Kramer Web site: www.kramerelectronics.com

8 Technical Specifications

The **VS-88HD** technical specifications are shown in Table 6:

Table 6: VS-88HD Technical Specifications[1]

INPUTS:	8 SMPTE-259M, 344M, 292M and 372M (dual link) serial video, 75Ω on BNC connectors
OUTPUTS:	8 equalized and reclocked SMPTE-259M, 344M, 292M and 372M (dual link) outputs 75Ω on BNC connectors
MAX. OUTPUT LEVEL:	800mVpp /75Ω
DATA RATE:	1.485Gbps
EQUALIZATION:	Automatic equalization for losses on 75Ω coaxial cable
CONTROLS:	Front-panel, RS-232, RS-485, ETHERNET, remote infrared
POWER SOURCE:	Universal, 100-240V AC, 50/60Hz 24VA
OPERATING TEMPERATURE:	0° to +40°C (32° to 104°F)
STORAGE TEMPERATURE:	-40° to +70°C (-40° to 158°F)
HUMIDITY:	10% to 90%, RHL non-condensing
DIMENSIONS:	19" x 7" x 1U W, D, H, rack mountable
WEIGHT:	2.6kg (5.7lbs) approx.
INCLUDED ACCESSORIES:	Power cord, rack "ears" and IR remote control transmitter
OPTIONS:	External remote IR receiver cable

9 Communication Parameters

The following table lists the communication parameters for Protocol 2000 and Protocol 3000.

Table 7: Communication Parameters

EDID			
EDID data is passed between Input 1 and Output 1			
RS-232			
Protocol 2000		**Protocol 3000 (Default)**	
Baud Rate:	9600	Baud Rate:	115,200
Data Bits:	8	Data Bits:	8
Stop Bits:	1	Stop Bits:	1
Parity:	None	Parity:	None
Command Format:	HEX	Command Format:	ASCII
Example (Output 1 to Input 1):	0x01, 0x81, 0x81, 0x81	Example (Output 1 to Input 1):	#AV 1>1<CR>
Switching Protocol			
P2000 -> P3000		**P3000 -> P2000**	
Command:	0x38, 0x80, 0x83, 0x81	Command:	#P2000<CR>
Front Panel:	Press LOCK and OUT 3 at the same time	Front Panel:	Press LOCK and OUT 2 at the same time
Ethernet			
Default Settings		**Reset Settings**	
IP Address: 192.168.1.39		Power cycle the unit while holding in the Factory Reset button, located on the rear panel of the unit.	
TCP Port #: 5000			
UDP Port #: 50000			

1 Specifications are subject to change without notice

10 Using the P3K Wizard

P3K is a Kramer software program for upgrading the machine firmware and accessing and changing device parameters. The P3K program can be downloaded from the Kramer Web site at www.kramerelectronics.com.

10.1 Changing the Device Parameters

To change the device parameters do the following:

1. Connect a PC to the **VS-88HD** using any one of the following connections:
   - Connect a serial cable from an RS-232 9-pin D-sub rear panel port on the PC to the **VS-88HD** as explained in section 6.4.
   - Connect an RJ-45 Ethernet cable from the Ethernet port on the PC to the Ethernet port on the **VS-88HD**.
2. Open the P3K Wizard by double-clicking the desktop icon **P3K Wizard**. The *P3K Wizard* screen appears[1]:

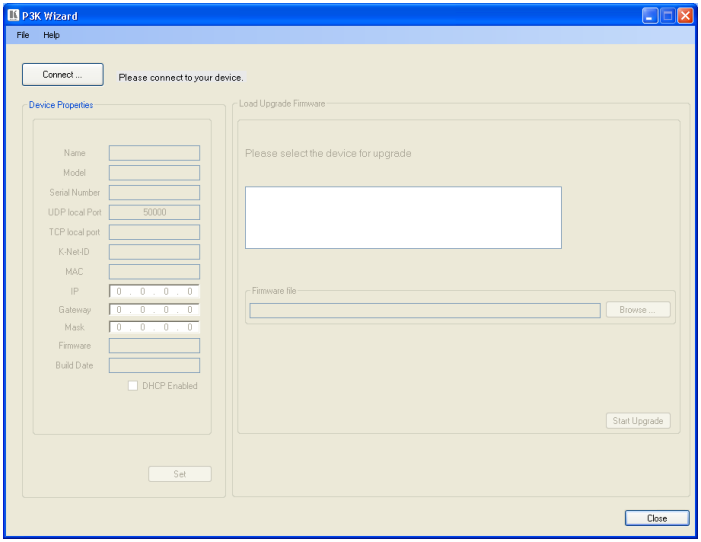


Figure 10: P3K Wizard Screen

3. Click the **Connect** button to open the *Connect* window.

1 The screens appearing in this manual are examples of the process. The actual screens may differ in their content.

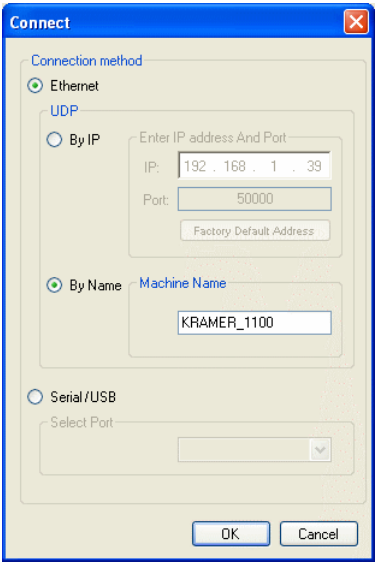


Figure 11: Connect Window

4. Choose the appropriate type of connection: Ethernet BY IP, BY NAME, or SERIAL/USB, and click **OK**.
   The Connect window disappears and the Device Properties window appears.

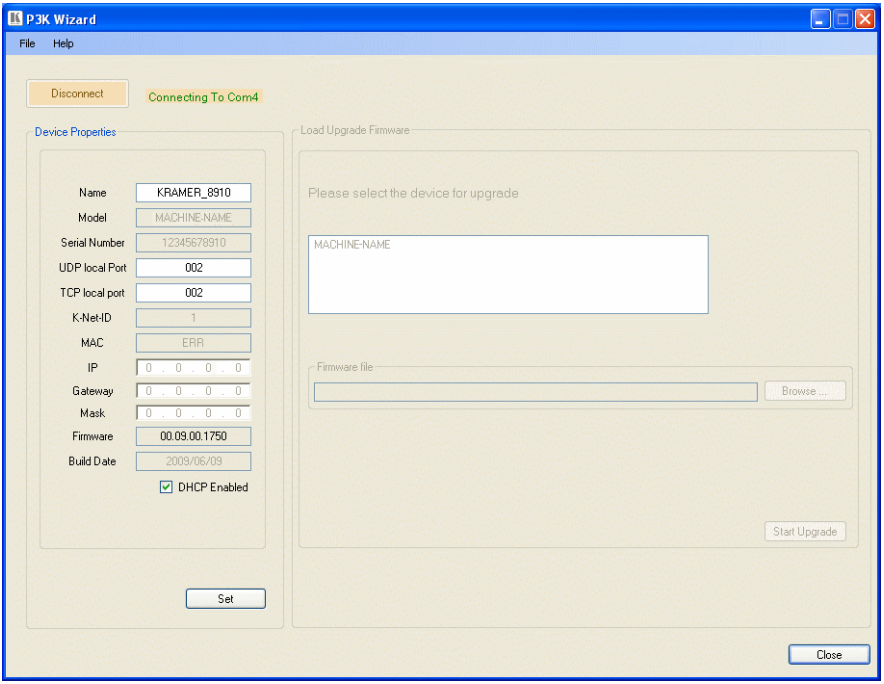


Figure 12: Device Properties Window

5. Change the parameters in the white fields as required and click **SET**.

10.2 Updating the VS-88HD Firmware

The **VS-88HD** uses a microcontroller that runs firmware located in FLASH memory.

The latest version of firmware and installation instructions can be downloaded from the Kramer Web site at www.kramerelectronics.com.

11 Kramer Protocol 3000

The **VS-88HD** can be operated using serial commands from a PC, remote controller, or touch screen. The unit communicates using the default Kramer Protocol 3000 but can also use Kramer Protocol 2000.

This section describes:

- How to switch between Protocol 3000 and Protocol 2000 (see section 11.1)
- Kramer Protocol 3000 syntax (see section 11.2)
- Kramer Protocol 3000 commands (see section 11.3)

11.1 Switching Protocols

Protocols can be switched either from the front panel buttons or by transmitting protocol commands.

To switch protocols using the front panel buttons:

- To choose Protocol 2000, press LOCK and OUT 2 at the same time
- To choose the Protocol 3000, press LOCK and OUT 3 at the same time

To switch protocols using protocol commands:

- To switch from Protocol 3000 to Protocol 2000, send the following command:
  #P2000<CR>
- To switch from Protocol 2000 to Protocol 3000, send the following command:
  0x38, 0x80, 0x83, 0x81

Note: If you are using Kramer's Windows®-based control software[1] it operates only with Protocol 2000. If the **VS-88HD** is set to Protocol 3000, it automatically switches to Protocol 2000.

1 Download the latest software from our Web site at http://www.kramerelectronics.com

11.2 Kramer Protocol 3000 Syntax

Protocol 3000 communicates at a data rate of 115200 baud, no parity, 8 data bits and 1 stop bit.

11.2.1 Host Message Format

Start	Address (optional)	Body	Delimiter
#	*Destination_id@*	**Message**	CR

11.2.2 Simple Command

Command string with only one command without addressing:

Start	Body	Delimiter
#	**Command** SP *Parameter_1,Parameter_2,…*	CR

11.2.3 Command String

Formal syntax with commands concatenation and addressing:

Start	Address	Body	Delimiter
#	*Destination_id@*	**Command_1** *Parameter1_1,Parameter1_2,…*| **Command_2** *Parameter2_1,Parameter2_2,…*| **Command_3** *Parameter3_1,Parameter3_2,…*|…	CR

11.2.4 Device Message Format

Start	Address (optional)	Body	delimiter
~	*Sender_id@*	**Message**	CR LF

11.2.5 Device Long Response

Echoing command:

Start	Address (optional)	Body	Delimiter
~	*Sender_id@*	**Command** SP [*Param1 ,Param2 …*] **result**	CR LF

CR = Carriage return (ASCII 13 = 0x0D)
LF = Line feed (ASCII 10 = 0x0A)
SP = Space (ASCII 32 = 0x20)

11.2.6 Command Terms

Command
A sequence of ASCII letters ('A'-'Z', 'a'-'z' and '-').
Command and parameters must be separated by at least one space.

Parameters
A sequence of alphameric ASCII characters ('0'-'9','A'-'Z','a'-'z' and some special characters for specific commands). Parameters are separated by commas.

Message string
Every command entered as part of a message string begins with a **message starting character** and ends with a **message closing character**.
Note: A string can contain more than one command. Commands are separated by a pipe ('|') character.

Message starting character
'#' – For host command/query
'~' – For machine response

Device address (Optional, for K-NET)
K-NET Device ID followed by '@'

Query sign
'?' follows some commands to define a query request.

Message closing character
CR – For host messages; carriage return (ASCII 13)
CRLF – For machine messages; carriage return (ASCII 13) + line-feed (ASCII 10)

Command chain separator character
When a message string contains more then one command, a pipe ('|') character separates each command.

Spaces between parameters or command terms are ignored.

11.2.7 Entering Commands

You can directly enter all commands using a terminal with ASCII communications software, such as HyperTerminal, Hercules, etc. Connect the terminal to the serial, Ethernet, or USB port on the Kramer device. To enter CR , press the Enter key.
(LF is also sent but is ignored by command parser).

For commands sent from some non-Kramer controllers like Crestron, some characters require special coding (such as, /X##). Refer to the controller manual.

11.2.8 Command Forms

Some commands have short name syntax in addition to long name syntax to allow faster typing. The response is always in long syntax.

11.2.9 Command Chaining

Multiple commands can be chained in the same string. Each command is delimited by a pipe character ('|'). When chaining commands, enter the **message starting character** and the **message closing character** only once, at the beginning of the string and at the end.

Commands in the string do not execute until the closing character is entered.

A separate response is sent for every command in the chain.

11.2.10 Maximum String Length

64 characters

11.2.11 Backward Support

Protocol 2000 is transparently supported by Protocol 3000. You can switch between protocols using a switch protocol command from either platform.

11.3 Kramer Protocol 3000 Commands

11.3.1 Device Initiated Messages

Command	Syntax
Switcher actions:	
Video channel has switched (breakaway mode)	VID IN>OUT

11.3.2 Result and Error Codes

	Syntax
Command ran successfully, no error.	COMMAND PARAMETERS OK
Protocol Errors:	
Syntax error	ERR001
Command not available for this device	ERR002
Parameter is out of range	ERR003
Unauthorized access (command run without the matching login).	ERR004

11.3.3 Basic Routing Commands

Command	Syntax	Response
Switch video	VID IN>OUT, IN>OUT, … Short form: V IN>OUT, IN>OUT, …	VID IN>OUT, IN>OUT, …RESULT
Read video connection	VID? OUT Short form: V? OUT VID? *	VID IN>OUT VID IN>1, IN>2, …

Parameter Description:

IN = Input number or '0' to disconnect output.

'>' = Connection character between in and out parameters.

OUT = Output number or '*' for all outputs.

Examples:

Switch video input 2 to output 4	#V 2>4CR	~VID 2>4 OKCRLF
Switch video input 4 to output 2 in machine number 6	#6@VID 4>2CR	~6@VID 4>2 OKCRLF
Disconnect video output 4	#AV 0>4CR	~AV 0>4 OKCRLF
Switch video input 3 to all outputs	#V 3>* CR	~VID 3>* OKCRLF
Chaining multiple commands	#V 1>* | V 3>4, 2>2, 2>1, 0>2 | V 3>9 | V? * CR 1. Switch video from input 1 to all outputs. 2. Switch video input 3 to output 4, video input 2 to output 2, video input 2 to output 1 and disconnect video output 2. 3. Switch video input 3 to output 9 (non-existent). 4. Get status of all video links. Command processing begins after entering CR . A response is sent for each command after processing.	~VID 1>* OKCRLF ~VID 3>4, 2>2, 2>1, 0>2 OKCRLF ~VID ERR003 CRLF ~VID 2>1, 0>2, 1>3, 3>4 CRLF

11.3.4 Preset Commands

Command	Syntax	Response
Store current connections to preset	PRST-STO PRESET Short form: PSTO PRESET	PRST-STO PRESET RESULT
Recall saved preset	PRST-RCL PRESET Short form: PRCL PRESET	PRST-RCL PRESET RESULT
Delete saved preset	PRST-DEL PRESET Short form: PDEL PRESET	PRST-DEL PRESET RESULT
Read video connections from saved preset	PRST-VID? PRESET,OUT Short form: PVID? PRESET,OUT PRST-VID? PRESET, *	PRST-VID PRESET, IN>OUT PRST-VID PRESET, IN>1, IN>2,…
Read saved presets list	PRST-LST? Short form: PLST?	PRST-LST PRESET, PRESET, …

Parameter Description:

PRESET = Preset number.

OUT = Output in preset to display, '*' for all.

Examples:

Store current video connections to preset 5	#PRST-STO 5CR	~PRST-STR 5 OKCRLF
Recall video connections from preset 3	#PRCL 3CR	~PRST-RCL 3 OKCRLF
Show source of video output 2 from preset 3	#PRST-VID? 3,2CR	~PRST-VID 3: 4>2 CRLF

11.3.5 Operation Commands

Command	Syntax	Response
Lock front panel	LOCK-FP LOCK-MODE Short form: LCK LOCK-MODE	LOCK-FP LOCK-MODE RESULT
Get front panel locking state	LOCK-FP?	LOCK-FP LOCK-MODE

Parameter Description:

LOCK-MODE = Front panel locking state:

'0' or 'off' to unlock front panel buttons

'1' or 'on' to lock front panel buttons

Reset device	RESET	RESET OK
Switch to protocol 2000*	P2000	P2000 OK

* Protocol 2000 has a command to switch back to ASCII protocol (like Protocol 3000)

11.3.6 Machine Information Commands

Command	Syntax	Response
Read in/out count	INFO-IO?	INFO-IO: IN INPUTS_COUNT, OUT OUTPUTS_COUNT
Read max preset count	INFO-PRST?	INFO-PRST: VID PRESET_VIDEO_COUNT
Reset to factory default configuration	FACTORY	FACTORY RESULT

11.3.7 Identification Commands

Command	Syntax	Response
Protocol handshaking	#CR	~OK CRLF
Read device model	MODEL?	MODEL MACHINE_MODEL
Read device serial number	SN?	SN SERIAL_NUMBER
Read device firmware version	VERSION?	VERSION MAJOR .MINOR .BUILD .REVISION
Set machine name	NAME MACHINE_NAME	NAME MACHINE_NAME RESULT
Read machine name	NAME?	NAME MACHINE_NAME
Reset machine name to factory default*	NAME-RST	NAME-RST MACHINE_FACTORY_NAME RESULT

*__Note__: The machine name is not the same as the model name. The machine name is used to identify a specific machine or a network in use (with DNS feature on).

MACHINE_NAME = Up to 14 alphameric chars.

* **Machine factory name =** Model name + last 4 digits from serial number.

11.3.8 Network Setting Commands

Command	Syntax	Response
Set IP address	NET-IP IP_ADDRESS Short form: NTIP	NET-IP IP_ADDRESS RESULT
Read IP address	NET-IP? Short form: NTIP?	NET-IP IP_ADDRESS
Read MAC address	NET-MAC? Short form: NTMC?	NET-MAC MAC_ADDRESS
Set subnet mask	NET-MASK SUBNET_MASK Short form: NTMSK	NET-MASK SUBNET_MASK RESULT
Read subnet mask	NET-MASK? Short form: NTMSK?	NET-MASK SUBNET_MASK
Set gateway address	NET-GATE GATEWAY_ADDRESS Short form: NTGT	NET-GATE GATEWAY_ADDRESS RESULT
Read subnet mask	NET-GATE? Short form: NTGT?	NET-GATE GATEWAY_ADDRESS
Set DHCP mode	NET-DHCP DHCP_MODE Short form: NTDH	NET-DHCP DHCP_MODE RESULT
Read subnet mask	NET-DHCP? Short form: NTDH?	NET-DHCP DHCP_MODE

DHCP_MODE =

'0' – Don't use DHCP (Use IP set by factory or IP set command).

'1' – Try to use DHCP, if unavailable use IP as above.

Change protocol Ethernet port	ETH-PORT PROTOCOL , PORT Short form: ETHP	ETH-PORT PROTOCOL ,PORT RESULT
Read protocol Ethernet port	ETH-PORT? PROTOCOL Short form: ETHP?	ETH-PORT PROTOCOL , PORT

PROTOCOL = TCP/UDP (transport layer protocol)

PORT = Ethernet port that accepts Protocol 3000 commands

1-65535 = User defined port

0 - Reset port to factory default (50000 for UDP, 5000 for TCP)

12 Hex Table (Protocol 2000)

Table 8 lists the Hex values for a single machine (MACHINE # 1):

Table 8: VS-88HD Hex Codes for Switching via RS-232/RS-485

	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6	OUT 7	OUT 8
IN 1	01	01	01	01	01	01	01	01
	81	81	81	81	81	81	81	81
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 2	01	01	01	01	01	01	01	01
	82	82	82	82	82	82	82	82
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 3	01	01	01	01	01	01	01	01
	83	83	83	83	83	83	83	83
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 4	01	01	01	01	01	01	01	01
	84	84	84	84	84	84	84	84
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 5	01	01	01	01	01	01	01	01
	85	85	85	85	85	85	85	85
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 6	01	01	01	01	01	01	01	01
	86	86	86	86	86	86	86	86
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 7	01	01	01	01	01	01	01	01
	87	87	87	87	87	87	87	87
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 8	01	01	01	01	01	01	01	01
	88	88	88	88	88	88	88	88
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81

13 Kramer Protocol 2000

The **VS-88HD** is compatible with Kramer's Protocol 2000[1], version 0.50. This RS-232/RS-485 communication protocol uses four bytes of information as defined below. The default data rate is 9600 baud, with no parity, 8 data bits, and 1 stop bit.

Table 9: Protocol Definitions

MSB							LSB
	DESTI-NATION	**INSTRUCTION**					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0
1st byte							
	INPUT						
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0
2nd byte							
	OUTPUT						
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0
3rd byte							
		MACHINE NUMBER					
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0
4th byte							

1st BYTE: Bit 7 – Defined as 0.
D – "DESTINATION": 0 - for sending information to the switchers (from the PC);
1 - for sending to the PC (from the switcher).
N5…N0 – "INSTRUCTION"
The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed via the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5…N0).

2nd BYTE: Bit 7 – Defined as 1.
I6…I0 – "INPUT".
When switching (i.e. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the INPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

3rd BYTE: Bit 7 – Defined as 1.
O6…O0 – "OUTPUT".
When switching (i.e. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done via the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE: Bit 7 – Defined as 1.
Bit 5 – Don't care.
OVR – Machine number override.
M4…M0 – MACHINE NUMBER.
Used to address machines in a system via their machine numbers. When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.

1 You can download our user-friendly "Software for Calculating Hex Codes for Protocol 2000" from the technical support section on our Web site at: http://www.kramerelectronics.com

For a single machine controlled via the serial port, always set M4…M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

Table 10: Instruction Codes for Protocol 2000

Note: All values in the table are decimal, unless otherwise stated.

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
0	RESET DEVICE	0	0	1
1	SWITCH VIDEO	Set equal to video input which is to be switched (0 = disconnect)	Set equal to video output which is to be switched (0 = to all the outputs)	2, 15
3	STORE VIDEO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3, 15
4	RECALL VIDEO STATUS	Set as SETUP #	0	2, 3, 15
5	REQUEST STATUS OF A VIDEO OUTPUT	Set as SETUP #	Equal to output number whose status is required	4, 3
15	REQUEST WHETHER SETUP IS DEFINED / VALID INPUT IS DETECTED	SETUP # or Input #	0 - for checking if setup is defined 1 - for checking if input is valid	8
16	ERROR / BUSY	For invalid / valid input (i.e. OUTPUT byte = 4 or OUTPUT byte = 5), this byte is set as the input #	0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 4 - invalid input 5 - valid input	9, 25
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
56	CHANGE TO ASCII	0	3 – Protocol 3000l	19
61	IDENTIFY MACHINE	1 - video machine name 3 - video software version	0 - Request first 4 digits 1 - Request first suffix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 3 - for SDI 4 - for remote panel 5 - for RS-422 controller	14

NOTES on the above table:

NOTE 1 - When the master switcher is reset, (e.g. when it is turned on), the reset code is sent to the PC. If this code is sent to the switchers, it will reset according to the present power-down settings.

NOTE 2 - These are bi-directional definitions. That is, if the switcher receives the code, it will perform the instruction; and if the instruction is performed (due to a keystroke operation on the front panel), then these codes are sent. For example, if the HEX code
01 85 88 83
was sent from the PC, then the switcher (machine 3) will switch input 5 to output 8. If the user switched input 1 to output 7 via the front panel keypad, then the switcher will send HEX codes:
41 81 87 83
to the PC.
When the PC sends one of the commands in this group to the switcher, then, if the instruction is valid, the switcher replies by sending to the PC the same four bytes that it was sent (except for the first byte, where the DESTINATION bit is set high).

NOTE 3 - SETUP # 0 is the present setting. SETUP # 1 and higher are the settings saved in the switcher's memory, (i.e. those used for Store and Recall).

NOTE 4 - The reply to a "REQUEST" instruction is as follows: the same instruction and INPUT codes as were sent are returned, and the OUTPUT is assigned the value of the requested parameter. The replies to instructions 10 and 11 are as per the definitions in instructions 7 and 8 respectively. For example, if the present status of machine number 5 is breakaway setting, then the reply to the HEX code
0B 80 80 85
would be HEX codes
4B 80 81 85

NOTE 8 - The reply is as in TYPE 3 above, except that here the OUTPUT is assigned with the value 0 if the setup is not defined / no valid input is detected; or 1 if it is defined / valid input is detected.

NOTE 9 - An error code is returned to the PC if an invalid instruction code was sent to the switcher, or if a parameter associated with the instruction is out of range (e.g. trying to save to a setup greater than the highest one, or trying to switch an input or output greater than the highest one defined). This code is also returned to the PC if an RS-232 instruction is sent while the machine is being programmed via the front panel. Reception of this code by the switcher is not valid.

NOTE 13 - This is a request to identify the switcher/s in the system. If the OUTPUT is set as 0, and the INPUT is set as 1, 2, 5 or 7, the machine will send its name. The reply is the decimal value of the INPUT and OUTPUT. For example, for a 2216, the reply to the request to send the machine name would be (HEX codes):

7D 96 90 81 (i.e. 128_{dec}+ 22_{dec} for 2nd byte, and 128_{dec}+ 16_{dec} for 3rd byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT - the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number after it. For example, for version 3.5, the reply to the request to send the version number would be (HEX codes):

7D 83 85 81 (i.e. 128_{dec}+ 3_{dec} for 2nd byte, 128_{dec}+ 5_{dec} for 3rd byte).

If the OUTPUT is set as 1, then the ASCII coding of the lettering following the machine's name is sent. For example, for the VS-7588YC, the reply to the request to send the first suffix would be (HEX codes):

7D D9 C3 81 (i.e. 128_{dec}+ ASCII for "Y"; 128_{dec}+ ASCII for "C").

NOTE 14 - The number of inputs and outputs refers to the specific machine which is being addressed, *not* to the system. For example, if six 16X16 matrices are configured to make a 48X32 system (48 inputs, 32 outputs), the reply to the HEX code

3E 82 81 82 (i.e. request the number of outputs)

would be HEX codes

7E 82 90 82

i.e. 16 outputs

NOTE 15 – When the OVR bit (4th byte) is set, then the "video" commands have universal meaning. For example, instruction 1 (SWITCH VIDEO) will cause all units (including data, etc.) to switch. Similarly, if a machine is in "FOLLOW" mode, it will perform any "video" instruction.

NOTE 16 - The reply to the "REQUEST WHETHER PANEL IS LOCKED" is as in NOTE 4 above, except that here the OUTPUT is assigned with the value 0 if the panel is unlocked, or 1 if it is locked.

NOTE 19 – After this instruction is sent, the unit will respond to the ASCII command set defined by the OUTPUT byte. The ASCII command to operate with the HEX command set must be sent in order to return to working with HEX codes.

NOTE 25 – For units which detect the validity of the video inputs, Instruction 16 will be sent whenever the unit detects a change in the state of an input (in real-time).

For example, if input 3 is detected as invalid, the unit will send the HEX codes

10 83 84 81

If input 7 is detected as valid, then the unit will send HEX codes

10 87 85 81.

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Safety Warning:
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